

REMARKS

Applicants have cancelled claims 35, 36, 37, 40 and 41 without prejudice expressly reserving the right to pursue the subject matter of the cancelled claims in subsequent applications.

Applicants have amended claims 15 and 32 by deleting reference to an exhaust gas recirculation device (now presented in claims 42 and 43 which are equivalent to previous dependent claims 40 and 41) to incorporate the features of dependent claims 40 and 41 and amended claim 32 to incorporate the features of dependent claim 37. Support for these amendments is also found in Figure 1 and page 22, lines 4-6, which depicts the post engine introduction of reducing agents into the full flow of exhaust gas, and page 3, line 20-page 4, line 3. The claims now recite that the reforming unit is configured as an autothermal reforming reactor and therefore as disclosed in page 3, line 20-page 4, line 3 of the application as filed (paragraph [0010] of the published application), the reforming process is limited to steam reforming and partial oxidation, because the combination of the two processes leads to the heat balance: the reforming unit generates hydrogen in the full flow of the exhaust.

Applicants have added new claims 42 and 43. New claims 42 and 43 depend on claim 15 and 32 respectively and recite that the exhaust gas aftertreatment device also comprises an exhaust gas recirculation arranged downstream of the reforming unit, as recited in claims 15 and 32 prior to the current amendment.

Applicants have added claims 44 and 45. Support for claims 44 and 45 is found in e.g. page 20, lines 15-18, page 21, lines 14-20 and Figure 1.

Claims 15, 16, 19 and 32-41 stand rejected under 35 U.S.C. §103(a) for purportedly being unpatentable over Stanglmaier et al. (U.S. Patent No. 6,732,507) in view of Stroia et al (U.S. Patent No. 6,745,560) and Bromberg et al. (U.S. 6,560,958). Applicants disagree and in view of the following remarks request that the Office reconsider and withdraw the rejection.

The exhaust gas aftertreatment device of Applicants' amended claim 15 differs from Stanglmaier et al. as the closest prior art by both the reformer and by the secondary injection. From Stanglmaier et al.'s description it follows that neither a reformer nor a secondary injection would be necessary or useful in the corresponding invention of Stanglmaier et al.

As set forth on page 4, line 4 to page 5, line 2 of the application as filed (¶[0011-0013] of published application), the purpose of the reformer is to produce hydrogen in order to improve the regeneration of the NOx storage catalytic converter and to improve ammonia formation. However, Stanglmaier et al. teaches that hydrogen is *already* present in the exhaust gas and is produced by fuel-rich combustion of the engine (col. 4, lines 29-36; 44-45). Therefore even if Stroia et al. discloses a reformer unit, one of skill in the art would not modify the NOx aftertreatment system of Stanglmaier et al. by introducing a reformer unit or a secondary injection device in order to produce hydrogen because the hydrogen was already available.

In addition, though Stroia et al. discloses a reformer unit and a secondary injection device upstream of the reformer unit, there are some essential differences. Firstly the reformer unit of Stroia et al. is not arranged in the main exhaust gas stream, but rather in one of two legs of the aftertreatment system (Fig. 4 and Fig. 5). Furthermore, hydrogen is produced by these reformer units by reforming fuel injected in a respective leg in order to improve NOx adsorber regeneration (col. 8, lines 13-16). However, the NOx adsorbers are regenerated with a reduced gas flow and therefore fuel is injected into a substream of the whole exhaust gas stream (col. 2, lines 35-41) and not into the full flow of exhaust gas. The same holds for Stroia's reforming process.

In contrast to Stroia's reforming process, in Applicants' invention the reforming process takes place in the full flow of exhaust gas, whereas in Stroia et al. only a relatively small amount of hydrocarbons is injected into a reduced flow and reformulated by the reformer unit within this reduced flow.

Applicants direct the Office's attention to the fact that in the embodiments of Stroia et al. where the reformer unit, i.e. the catalyzed soot filter, is arranged in the main exhaust gas stream (Fig. 1 and Fig. 2), there is no secondary fuel injection provided upstream of this "fuel

reformer". A secondary fuel injection upstream of the reforming is required by Applicants' current claims.

Furthermore, there is no disclosure or suggestion that the reformer could be configured as an authothermal reforming reactor or that the reforming process could be an autothermal one. Even though, with respect to former claim 40, the Office alleged that Stroia et al. teaches an autothermal reforming unit, the Office cites no specific passage in as proving such a teaching. In fact, no such information can be found in Stroia.

Thus the combination of Stroia et al. and Stranglmaier et al. does not produce a gas after treatment device comprising a NO_x storage catalytic converter downstream of a reformer unit with an upstream secondary fuel injection or a process that takes place in the full exhaust stream with a fuel injection upstream of a reforming step as claimed by Applicants.

The deficiencies of Stranglmeir and Stroia are not cured by their combination with Bromberg et al. Bromberg et al. was cited for allegedly teaching that it is conventional in the art to arrange an EGR line downstream of the reformer to recirculate any parasitic emissions and any unused reformat from the adsorber catalyst back to the engine (Claims 15 and 32 no longer recite an EGR, an EGR is now recited in dependent claims 42 and 43). However, Bromberg et al. does not teach or suggest that the reformer could be configured as an authothermal reforming reactor or that the reforming process could be an autothermal one. Nor does Bromberg et al. teach or suggest arranging an EGR or reforming unit in the main exhaust stream. Bromberg et al. teaches that the EGR branches off the main exhaust gas line downstream of the NSC and the reformer is arranged in a side stream with a separate supply of oxygen, steam and fuel.

Altogether Applicants submit that the invention as claimed in the currently amended claims is not obtained by a combination of Stanglemaier et al., Stroia et al. and Bromberg et al. Applicants request that the rejection of the claims under 35 U.S.C. §103(a) for purportedly being unpatentable over the cited references be withdrawn.

Claims 17 and 18 stand rejected under 35 U.S.C. §103(a) for purportedly being unpatentable over Stanglemaier et al., in view of Stroia et al. and Bromberg et al., as applied to claims 16 and 15 and further in view of Murachi et al. (U.S. Patent No. 5,746,989). Applicants disagree and in view of the following remarks request that the Office reconsider and withdraw the rejection.

The deficiencies of Stanglmaier et al., Stroia et al. and Bromberg et al. are discussed above. Combining these references with Murachi et al. also fails to teach or suggest the invention as claimed. The Office states that Murachi et al. disclose a system for purifying exhaust gas of an internal combustion engine, comprising a NOx storage catalytic converter (9) and a three-way catalytic converter (TWC) located upstream of the NOx storage catalytic converter (9). However, Murachi et al. fails to teach or suggest a secondary injection upstream of the reforming unit upstream of a NOx storage catalytic converter. Thus one of skill in the art combining Stanglmaier et al., Stroia et al. and Bromberg et al. and Murachi et al. would not be guided to the invention as claimed. Thus the combination of the four references fails to render the invention as claimed obvious.

In view of the foregoing remarks, Applicants request that the Examiner reconsider and withdraw the rejection of the claims under 35 U.S.C. §103(a) for purportedly being unpatentable over Stanglmaier et al., in view of Stroia et al. and Bromberg et al. and further in view of Murachi et al.

Applicants submit that this application is now in condition for allowance. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

Application No. 10/552,263
Reply
Attorney Docket No. 095309.56876US

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket # 095309.56876US).

Respectfully submitted,

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